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The Economic Consequences of Increased Disclosure

CHRISTIAN LEUZ AND ROBERT E. VERRECCHIA*

ABSTRACT

Economic theory suggests that a commitment by a firm to increased levels of disclosure should lower the information asymmetry component of the firm's cost of capital. But while the theory is compelling, so far empirical results relating increased levels of disclosure to measurable economic benefits have been mixed. One explanation for the mixed results among studies using data from firms publicly registered in the United States is that, under current U.S. reporting standards, the disclosure environment is already rich. In this paper, we study German firms that have switched from the German to an international reporting regime (*IAS* or U.S. *GAAP*), thereby committing themselves to increased levels of disclosure. We show that proxies for the information asymmetry component of the cost of capital for the switching firms—namely, the bid-ask spread and trading volume—behave in the predicted direction compared to firms employing the German reporting regime.

[KEYWORDS: disclosure; cost of capital; international accounting; information asymmetry.]

1. Introduction

A major link between economic theory and contemporary accounting thought is the notion that a firm's commitment to greater disclosure should lower costs of capital that arise from information asymmetries. A

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brief sketch of the economic theory is as follows. Information asymmetries create costs by introducing adverse selection into transactions between buyers and sellers of firm shares. In real institutional settings, adverse selection is typically manifest in reduced levels of liquidity for firm shares (e.g., Copeland and Galai [1983], Kyle [1985], and Glosten and Milgrom [1985]). To overcome the reluctance of potential investors to hold firm shares in illiquid markets, firms must issue capital at a discount. Discounting results in fewer proceeds to the firm and hence higher costs of capital.

A commitment to increased levels of disclosure reduces the possibility of information asymmetries arising either between the firm and its shareholders or among potential buyers and sellers of firm shares.¹ This, in turn, should reduce the discount at which firm shares are sold, and hence lower the costs of issuing capital (e.g., Diamond and Verrecchia [1991] and Baiman and Verrecchia [1996]).

While the theory that relates the level of disclosure and the firm's cost of capital is compelling, so far the empirical results have been mixed. Aside from the difficulties of measuring the cost of capital directly and estimating this relation, one potential explanation for the mixed empirical results among studies using data from firms publicly registered in the United States is that, under current U.S. Generally Accepted Accounting Principles (U.S. *GAAP*), the disclosure environment is already rich. Consequently, commitments to increased levels of disclosure in the United States are largely incremental, thereby leading to economic consequences that are difficult to substantiate empirically.

In contrast, the disclosure levels in Germany under current German *GAAP* have been criticized as being relatively low. Responding to this criticism, several German firms have adopted "internationally accepted reporting strategies," i.e., they now use either International Accounting Standards (*IAS*) or U.S. *GAAP*, as opposed to German standards, for their financial reporting to the capital markets. Due to the different disclosure requirements under the various reporting regimes, a switch from German *GAAP* to either *IAS* or U.S. *GAAP* is thought to represent a substantial increase in a firm's commitment to greater disclosure. This, in turn, suggests that firms electing either *IAS* or U.S. *GAAP* should evidence measurable economic benefits in the form of a lower information asymmetry component of the cost of capital.

¹ Note that the theory is sufficiently broad as to allow the notion of "increased levels of disclosure" to be interpreted as either an increase in the *quantity* of disclosure or an increase in the *quality* of disclosure (or both). Our use of the expression "increased levels" is primarily for expositional convenience and should not be interpreted as exclusively the former (i.e., an increase in quantity). In addition, the theory makes no distinction as to how the information asymmetries arise (e.g., between a firm and its shareholders, among potential buyers and sellers of firm shares, etc.). The only requirement is that the information asymmetries manifest themselves as a liquidity premium in the price at which trades are executed.

This paper attempts to document these economic benefits empirically. We focus on proxies for the information asymmetry component: namely, the bid–ask spread, trading volume, and share price volatility.² We find in a cross-sectional analysis that firms that commit to either *IAS* or U.S. *GAAP* exhibit lower percentage bid–ask spreads and higher share turnover than firms using German *GAAP*. These differences are economically and statistically significant when we control for various firm characteristics as well as self-selection bias. A subsequent analysis of the bid–ask spread and trading volume around the switch to international reporting produces corroborating results. However, we are unable to document a reduction in share price volatility. To further substantiate our findings, we explore several alternative explanations, such as listing effects and differences in investor relations, and perform extensive robustness checks.

In examining firms that have switched to internationally accepted accounting and disclosure standards, we also contribute to the international accounting literature. Much of the current debate on globally accepted, high-quality accounting standards is based on the notion that higher disclosure standards reduce the firm's cost of capital (e.g., Levitt [1998]). Therefore, our findings are relevant to standard setters as well as firms around the world contemplating a switch to internationally accepted standards such as *IAS* or U.S. *GAAP*.³

In section 2 we briefly review prior research on this topic. In section 3 we explain in detail the institutional setting in which German firms adopted various reporting strategies to address perceived inadequacies in German *GAAP*. In section 4 we discuss our hypothesis and research design. In sections 5 and 6 we present our empirical results. A final section concludes the paper.

2. Prior Research

Recently, several studies have examined the link between disclosure and the firm's cost of capital.⁴ The results are mixed, however, and depend on the disclosure metric and research design used. Moreover, few studies control explicitly for self-selection.

Botosan [1997] documents a significant relation between her disclosure index and the firm's cost of capital only for firms with low analyst

²Several extant studies suggest that information asymmetry and illiquidity is compensated in stock returns. See, e.g., Amihud and Mendelson [1986; 1989] and Brennan and Subrahmanyam [1996].

³Note, however, that we do not advocate that firms switch to either *IAS* or U.S. *GAAP*. Our paper examines only the benefits of such a decision but is silent on the costs of international reporting.

⁴There are also papers that investigate disclosures and information asymmetry around equity offerings (e.g., Lang and Lundholm [1997] and Marquardt and Wiedman [1998]). In addition, there are studies that examine the behavior of trading volume (e.g., Atiase and Bamber [1994]) and bid–ask spreads (for a survey, see Callahan, Lee, and Yohn [1997]) around information events. In contrast to these studies, our focus is on the long-term effects of disclosure on information asymmetry and liquidity.

following. Using a similar index for foreign firms trading in U.S. equity markets, Botosan and Frost [1998] find a significant association between liquidity and the timeliness, but not the level, of disclosure.

Welker [1995] and Sengupta [1998] use analyst ratings of the firm's overall disclosure policy and demonstrate that firms with higher disclosure ratings have, on average, lower bid-ask spreads and lower cost of debt at the time of the issue, respectively. Healy, Hutton, and Palepu [1999] show that firms with sustained increases in disclosure ratings exhibit improvements in a number of variables, including the bid-ask spread. A concern with disclosure ratings, however, is that they represent only analysts' perceptions of voluntary disclosures. Moreover, voluntary disclosures can be reversed and therefore may not necessarily represent a commitment to disclose in the future.⁵

To digress briefly, the distinction between a commitment and a voluntary disclosure is that the former is a decision by the firm about what it will disclose *before* it knows the content of the information (i.e., *ex ante*), whereas the latter is a decision by the firm made *after* it observes the content (i.e., *ex post*). This suggests that the relation between the cost of capital and a commitment should be stronger than the relation between the cost of capital and a voluntary disclosure because only a commitment requires that information be disclosed *regardless* of its content (see, e.g., Diamond and Verrecchia [1991] and Baiman and Verrecchia [1996]).

Although in principle a switch to international reporting can be reversed, we believe that using a switch as our disclosure proxy captures better a firm's commitment than an increase in voluntary disclosure. As we discuss, compared to German *GAAP*, both *IAS* and U.S. *GAAP* require many additional disclosures before an unqualified audit opinion is achieved. Thus, while the switch itself is voluntary, the additional disclosures are mandatory once the firm has committed to an international reporting strategy. Moreover, the switch necessitates changes in the firm's accounting system that are not easily reversed.

Greenstein and Sami [1994] and Boone [1998] assess the impact of specific mandated reporting changes on bid-ask spreads. The significance levels of their results, however, are relatively low. Bartov and Bodnar [1996] examine whether differences in information asymmetry explain more informative accounting choices, whereas we attempt to document a reduction in the information asymmetry component of the firm's cost of capital subsequent to the reporting change.⁶ Piotroski [1999] finds that expanded segment disclosures are associated with positive analysts' fore-

⁵ Consistent with this concern, Bushee and Noe [2000] report that the *change* in *AIMR* disclosure ratings is on average about zero but exhibits substantial standard deviation (see their table 2). Miller [1999] documents that firms expand and reverse voluntary disclosures as a function of earnings performance.

⁶ In their sensitivity tests, however, Bartov and Bodnar [1996] also report an increase in trading volume in the year following the accounting choice.

cast revisions and increase the earnings' capitalization rate, but is unable to document significant changes in liquidity.

Few studies explicitly consider the adoption of different sets of accounting standards. Auer [1998] examines changes in share price volatility and the firm's beta factor for Swiss firms that have switched to *IAS*. He finds a small but insignificant reduction in volatility and no change in the beta factor.⁷ Ashbaugh and Pincus [1999] investigate the accuracy of analysts' forecast errors before and after the adoption of *IAS* by non-U.S. firms and find that the change in forecast errors is weakly negative. Finally, Leuz [1999*b*] examines German firms that face a similar regulatory environment, but by virtue of their listing on the "New Market"—a market segment for growth firms in emerging industries—have to provide financial statements in accordance with *either IAS* or U.S. *GAAP*. He documents that the choice between *IAS* and U.S. *GAAP* has no measurable consequences for the bid-ask spreads and trading volume of these firms.⁸

3. *International Reporting Strategies by German Firms*

German accounting standards and disclosure practices are commonly criticized in the Anglo-American financial press and investors' community.⁹ The main complaints are: too much discretion in German standards allows firms to manage income using large "silent reserves"; German reporting is too heavily influenced by tax avoidance strategies; and German standards lack detailed disclosures designed to satisfy the information needs of investors and financial analysts.

In recent years, many German academics have argued that a reform of German *GAAP* for consolidated financial statements is necessary to address these concerns (e.g., Ordelheide [1998]). Moreover, German managers have had difficulty "explaining" their (German *GAAP*) financial results to foreign investors and have claimed that a lack of international acceptance of German financial statements has led to disadvantages when raising capital.¹⁰ In response to these problems, many German

⁷ The former is consistent with Bushee and Noe [2000]. The latter is not surprising since a relation between the firm's disclosure and its beta factor has little support in theory. Similarly, Healy, Hutton, and Palepu [1999] find no evidence for a change in the beta factor due to increased disclosure ratings.

⁸ However, consistent with the evidence in our paper, he finds that bid-ask spreads are lower and turnover is higher for New Market firms relative to matched *MDAX* firms providing German *GAAP* reports.

⁹ See, e.g., "Investors Chronicle, Whose Bottom Line Is It Anyway?" *Financial Times Business Reports* (1/14/94), p. 64; R. Evans, "Brave New Welt: German Companies Finally Become More Shareholder-Friendly," *Barron's* (12/23/96), p. 24; and Review and Outlook (Editorial), "Shake It Up," *Wall Street Journal* (7/15/97), p. A18.

¹⁰ See, e.g., A. Raghavan and M. Sesit, "Foreign Firms Raise More Money in the U.S. Markets," *Wall Street Journal* (10/5/93), p. A1; S. Ascarelli, "Deutsche Bank to Disclose Hidden Reserves for 1995," *Wall Street Journal* (12/20/95), p. 10; and "Deutschland braucht neue Bilanzierungsregeln," *Börsenzeitung* (9/30/97), p. 4, all citing quotations from German *CFOs* and company officials.

firms have changed their reporting and disclosure policy.¹¹ As a Deutsche Bank's spokesman put it: "We are doing this [adopting *IAS* standards] to prevent investors from turning away from Deutsche Bank because they think they are not getting enough information" (see *WSJ* [12/20/1995], p. 10). Pellens and Tomaszewski [1999] survey managers of *DAX 100* firms and report that almost 50% of the respondents believe that a switch to *IAS* or U.S. *GAAP* translates into a reduction in the firm's cost of capital due to increased disclosure.

German firms have adopted three strategies to be in conformity with international accounting and disclosure standards (see table 1). First, under so-called dual reporting, firms produce financial statements that are as close as possible to *IAS* or U.S. *GAAP* without violating German *GAAP*. That is, using their discretion under German *GAAP*, firms elect accounting methods compatible with international standards. In addition, they provide the necessary disclosures in the notes. Under the second strategy, firms follow German *GAAP* for their financial statements but reconcile their income and shareholders' equity with either *IAS* or U.S. *GAAP*. Additional disclosures required under *IAS* or U.S. *GAAP* are provided in the notes. The third strategy is to provide separate financial statements and disclosures in accordance with *IAS* or U.S. *GAAP* in addition to the German statements.

All these strategies have no immediate tax or dividend implications because they apply to the consolidated financial statements only.¹² Note also that, until April 1998, firms were required to prepare consolidated financial statements in accordance with German *GAAP*—despite an international reporting strategy. This requirement was abandoned with the enactment of the *KapAEG* law, which reacts to pressure from firms who were preparing two sets of consolidated financial statements (i.e., German and international) as well as to an increasing number of firms seeking to comply with internationally accepted reporting standards.¹³ It stipulates that exchange-listed corporations may prepare their consolidated financial statements in accordance with either *IAS* or U.S. *GAAP* (instead of German *GAAP*). In response to *KapAEG*, many German firms have announced their intention to switch to either *IAS* or U.S. *GAAP* in the future.¹⁴

¹¹ We acknowledge, however, that there may be other reasons (aside from increased disclosure) that firms adopt international reporting strategies.

¹² In Germany, taxes and dividends are tied to a firm's parent-only statements (or individual accounts), which are distinct from the consolidated statements (or group accounts).

¹³ *KapAEG* stands for *Kapitalaufnahmeerleichterungsgesetz*. See *Bundesgesetzblatt, Jahrgang 1998*, pt. 1, no. 22, Bonn, April 23, 1998.

¹⁴ We identify ten firms that have switched for fiscal years ending between June 1998 and March 1999 and hence after the enactment of *KapAEG* (see panel B of table 1). Our cross-sectional analysis in section 5 covers only pre-*KapAEG* reporting and hence classifies these firms as German *GAAP* firms. This classification works against our hypothesis. Re-estimating our regressions without these firms produces similar results to those reported below—at slightly higher significance levels.

TABLE 1

Description of the International Reporting Strategies of the DAX 100 Firms

Our sample is composed of 102 German firms included in the *DAX 100* stock index over the course of 1998. The reporting strategies are determined as of the fiscal year ending between 7/1/97 and 6/31/98.

| Panel A: Number of Firms following IAS or U.S. GAAP by Reporting Strategy | | |
|---|-----|----------------|
| | IAS | U.S. GAAP |
| Dual Reporting ¹ | 10 | 1 |
| Reconciliation of Shareholders' Equity and Profits | 0 | 3 ² |
| Complete Set of Financial Statements ³ | 4 | 3 |

| Panel B: Adoption of International Reporting Strategies Across Time ⁴ | | |
|--|-----------------|---|
| Year of Adoption ⁵ | Number of Firms | Strategies |
| 1993 | 2 | Reconciliation (1); Dual Reporting (1) |
| 1994 | 4 | Full Report (1); Dual Reporting (3) |
| 1995 | 5 | Full Report (1); Reconciliation (1); Dual Reporting (3) |
| 1996 | 5 | Full Report (2); Reconciliation (2); Dual Reporting (1) |
| 1997 | 5 | Full Report (2); Dual Reporting (3) |
| 1998 ⁶ | 10 | Full Report (7); Reconciliation (3) |

¹"Dual reporting" refers to providing additional information in the notes and applying *IAS* or *U.S. GAAP* accounting standards that do not contradict German *GAAP*. Since there is no precise definition for dual reporting, we also attempt to identify firms that effectively follow a dual reporting strategy without explicitly calling it this. In order to qualify, firms have to make reference to international reporting standards, provide substantial additional disclosure, and apply at least some *IAS* or *U.S. GAAP* standards. In addition, we require that they have already announced a complete switch to *IAS* or *U.S. GAAP* in the future to ensure their commitment to an international reporting strategy. Four firms satisfy these criteria.

²All three firms submit Form 20-F to the *SEC*. One of our sample firms with a dual reporting strategy provides an additional reconciliation from *IAS* to *U.S. GAAP* that is not included in this count.

³These financial statements are in addition to *consolidated* German *GAAP* statements. For fiscal years ending after April 1998, however, firms no longer have to provide two sets of consolidated statements and may provide statements according to *IAS* or *U.S. GAAP* only.

⁴Note that international reporting strategies may have changed since the initial adoption and hence the distribution of strategies in this panel may not match the current distribution or the data in panel A.

⁵Five firms do not have a trading history with German *GAAP* financial statements only. These firms have followed international reporting strategies since the initial public offering and hence did not "switch" in the literal sense and hence are not used in the event study.

⁶Because sufficient data were not yet available, these ten firms are used *only* for an event study involving the bid-ask spreads. Note also that after April 1998, firms can disregard compliance with German *GAAP* for their consolidated financial statements.

An important issue for our study is whether the described international reporting strategies in fact imply an increase in the level (and/or quality) of disclosure. Anecdotal evidence from the financial press is consistent with this conjecture.¹⁵ Similarly, firms that switch to either *IAS* or *U.S. GAAP* standards claim that they are satisfying investors' demand for

¹⁵ See S. Woodward, "Benz Opens Its Books for U.S. Investors," *New York Times* (5/30/93), p. 11; S. Hamilton, "Accountants Gather Round Different Standards," *Financial Times* (3/20/98), p. 12; and K. Küting, "Ein wichtiger Schritt in Richtung Internationalität," *Die Welt* (3/26/99).

greater transparency and international comparability.¹⁶ Surveys by Förtschle, Glaum, and Mandler [1995; 1998] report that a majority of German managers and academics share the view that U.S. *GAAP* statements provide more information than German *GAAP* statements. Similarly, *The Economist* ([4/27/1996], p. 79) asserts that after recent improvements, *IAS* disclosure requirements “are far tougher than those of most countries’ national accounting standards.”

In the accounting literature, the differences between *IAS*, U.S. *GAAP*, and German *GAAP*, as well as their relative merits, have been discussed extensively. Comparisons of the standards generally conclude that (at a minimum) *IAS* and U.S. *GAAP* have fewer explicit accounting choices and increase the amount of financial disclosure (e.g., Ballwieser [1997] and Ordeltcheide [1998; 1999]). In addition, there is empirical support that U.S. *GAAP* improves measurement and produces accounting numbers that have higher information content and are more value-relevant and timelier than German *GAAP*.¹⁷ Ashbaugh [1999] and d’Arcy [2000] provide evidence that *IAS* require more disclosures and have fewer accounting choices than German *GAAP*, respectively.¹⁸ Moreover, Harris and Muller [1999] find that based on reconciliation amounts *IAS* appear to be closer to U.S. *GAAP* than foreign *GAAP*.

In addition to the arguments and evidence presented above, we check whether international reports obtain higher disclosure ratings than German *GAAP* reports. The results reported in section 5 support this conjecture. Thus, we claim that a switch to international reporting represents a substantial increase in a firm’s commitment to disclosure. Note that a firm could voluntarily provide information required under *IAS* or U.S. *GAAP* in the notes of the German financial statements without adopting an international reporting strategy. The key point, however, is that *IAS* and U.S. *GAAP* require these disclosures. Thus, by adopting either standard, a German firm effectively *commits* to certain disclosures irrespective of future results of operation. That is, it has to provide this information even in those situations where nondisclosure might be a preferred strategy.

4. Hypothesis Development and Research Design

As outlined in the introduction, economic theory suggests that a commitment by a firm to increased levels of disclosure should lower the information asymmetry component of the firm’s cost of capital. The difficulty lies in demonstrating this relation empirically. There are three

¹⁶ See, for example, the annual reports of Allianz or RWE.

¹⁷ See, e.g., Alford et al. [1993], Harris, Lang, and Möller [1994], and Ball, Kothari, and Robin [1998], respectively.

¹⁸ Note that both studies came to this conclusion even before the completion of the *IASB*’s comparability and improvement project. Since then, *IAS* standards have become even more stringent.

major problems: (1) the firm's cost of capital and in particular its information asymmetry component cannot be observed directly; (2) a commitment to more disclosure has both "news" and "information asymmetry" effects, which have to be separated; and (3) self-selection bias. Our research design attempts to address each of these concerns.

First, the literatures of economics, finance, and accounting offer various proxies for the information asymmetry component of a firm's cost of capital. In this study we choose as proxies the bid-ask spread, trading volume in firm shares, and share price volatility. The relation between these proxies and the firm's cost of capital is well established in theory (e.g., Stoll [1978b], Glosten and Milgrom [1985], and Admati and Pfleiderer [1988]). In addition, several studies provide evidence that information asymmetry and illiquidity are reflected in stock returns (e.g., Amihud and Mendelson [1986; 1989] and Brennan and Subrahmanyam [1996]).

To elaborate briefly on our proxies, the bid-ask spread is commonly thought to measure information asymmetry explicitly. The reason for this is that the bid-ask spread addresses the adverse selection problem that arises from transacting in firm shares in the presence of asymmetrically informed investors. Less information asymmetry implies less adverse selection, which, in turn, implies a smaller bid-ask spread.

An alternative, and perhaps less explicit, proxy for adverse selection is trading volume in firm shares. Trading volume is a measure of liquidity in that it captures the willingness of some investors who hold firm shares to sell and the willingness of others to buy. This willingness to transact in firm shares should be inversely related to the existence of information asymmetries. Trading volume, however, can be influenced by a host of other factors unrelated to information. These factors include portfolio rebalancing, liquidity shocks, changes in risk preferences, etc. Consequently, trading volume may not capture exclusively adverse selection among shareholders.¹⁹

Finally, share price volatility has been used by prior studies as a proxy for information asymmetry (e.g., Lang and Lundholm [1993]). To the extent that smooth transitions in share prices suggest the absence of information asymmetries between the firm and shareholders, or among investors, *low levels of volatility suggest fewer information asymmetries*. As with trading volume, however, volatility is influenced by many factors unrelated to information asymmetry. Moreover, Bushee and Noe [2000] demonstrate that the effect of disclosure on volatility is complex and may depend on the type of (institutional) investors attracted to the firm.

¹⁹ There is, however, some empirical evidence supporting our choice of trading volume as an inverse proxy for information asymmetry. Easley et al. [1996] show that the probability of information-based trading is decreasing in trading volume and Grammig, Schiereck, and Theissen [1999] confirm their findings for the German market.

For these reasons, as a measure of information asymmetry, volatility is likely to be the least reliable among the three proxies.

Assuming that bid–ask spreads, trading volume, and share price volatility are appropriate proxies for the existence of information asymmetries, we hypothesize that a switch to an international reporting regime leads to a lower bid–ask spread, more trading volume, and less share price volatility.

With regard to our second major problem—to assess the impact of international reporting strategies on our information asymmetry proxies, we can study the effect across firms by explicitly controlling for various other determinants of the information asymmetry component of the firm’s cost of capital, or we can examine the change in the proxies around the switch to international reporting strategies (“event study”). Each design has advantages and disadvantages. The cross-sectional design is less prone to confusion between the “news” and the “information asymmetry” effect of a commitment to more disclosure. The change in firm value that occurs when the firm switches to a superior disclosure regime comprises both a change in expectations about the firm’s future performance as well as a reduction in the firm’s cost of capital. The former occurs around the switch and its direction depends on the news or information content of the disclosure. The latter is permanent and captures the reduction in information asymmetry and increase in liquidity. Thus, its direction is independent of the news content.²⁰ By estimating a cross-sectional relation between our proxies and the firm’s reporting strategy well after firms have switched the disclosure regime, we should be able to separate the two effects and focus on the “information asymmetry” effect.

An “event study” design observes the behavior of our proxies around the reporting change and hence mitigates the possibility that some other unobserved variable (and not the disclosure policy) is responsible for the cross-sectional differences in the proxies. Thus, we use it as a consistency check. Unfortunately, the event study is more demanding in its data requirements, reducing the number of observations and hence limiting the tests that can be performed.

With regard to our third concern, the key problem in estimating the cross-sectional regression is that firms *choose* their reporting strategy considering the costs and benefits of international reporting. There, an *OLS* regression of the proxy for cost of capital on firm characteristics and a dummy for the firm’s reporting strategy would suffer from self-selection bias (e.g., Heckman [1978]). In response to the self-selection problem, we estimate the following two-equation model, which has been used in the literature to measure “treatment effects” (e.g., Greene [1997]):

$$d_i^* = \gamma' \mathbf{z}_i + \varepsilon_i \quad (\text{Disclosure Model})$$

$$a_i = \delta d_i + \beta' \mathbf{x}_i + u_i \quad (\text{Cost of Capital Model})$$

²⁰ The Jenkins Committee (AICPA [1994], Ewert [1999], and Lang [1999]) also makes this distinction.

where $d_i = 1$ if $d_i^* > 0$ and $d_i = 0$ otherwise, d_i^* is the firm's *unobservable* net benefit of international reporting, d_i is its reporting choice, \mathbf{z}_i is a vector of variables determining the firm's reporting strategy, a_i is the information asymmetry component of the firm's cost of capital, \mathbf{x}_i is a vector of *exogenous* variables determining this component, and u_i and ε_i are normally distributed disturbances.

The first equation specifies a probit regression and models the firm's reporting decision in order to control for self-selection. The second equation models the link between the information asymmetry component of the firm's cost of capital, its disclosure strategy, and other firm characteristics. This specification takes into account that the reporting variable is endogenous and measures the marginal effect of the disclosure proxy. Note that we do not include the information asymmetry proxy a_i in the disclosure model. This specification would be inconsistent because the decision to switch to an international reporting strategy precedes the change in information asymmetry.²¹ It seems reasonable, however, to assume that firms also consider the *expected* change in information asymmetry and hence their cost of capital when making the reporting decision. Thus, we have to include variables in the disclosure model that proxy for the *expected* net benefits of expanded disclosure and hence (indirectly) control for endogeneity.²²

As the disturbances of the two regressions are correlated, a simple *OLS* estimation of the cost of capital model produces inconsistent coefficients. To consistently estimate the parameter of such a system, we include an additional term in the cost of capital model to account for self-selection. From the above specification, it follows that:

$$E(a_i | d_i = 1) = \beta' \mathbf{x}_i + \delta + E(u_i | \varepsilon_i > -\gamma' \mathbf{z}_i)$$

and:

$$E(a_i | d_i = 0) = \beta' \mathbf{x}_i + E(u_i | \varepsilon_i \leq -\gamma' \mathbf{z}_i).$$

Using expressions for means of truncated normal distributions, we obtain:

$$E(a_i | d_i = 1) = \beta' \mathbf{x}_i + \delta + \sigma_{12} \frac{\phi(\gamma' \mathbf{z}_i)}{\Phi(\gamma' \mathbf{z}_i)}$$

and:

$$E(a_i | d_i = 0) = \beta' \mathbf{x}_i - \sigma_{12} \frac{\phi(\gamma' \mathbf{z}_i)}{1 - \Phi(\gamma' \mathbf{z}_i)}$$

²¹ More generally, Maddala [1983, p. 118] shows that including c_i (i.e., the endogenous variable of the second equation) in the selection equation leads to a logically inconsistent model unless either the coefficient of the dummy or the coefficient of c_i is restricted to zero.

²² See Maddala [1991, pp. 803–4] and Shehata [1991] for this approach to addressing simultaneity.

where $\sigma_{12} = \text{Cov}(u_i, \varepsilon_i)$ and $\phi(\cdot)$ and $\Phi(\cdot)$ are the density and distribution function of the standard normal (see Maddala [1983, p. 121]). The last term in each expression is the inverse Mills ratio, which can be obtained from the probit model. Including these terms in the cost of capital model accounts for self-selection and yields consistent parameter estimates using *OLS*.²³ For correct inferences, the standard errors have to be adjusted to account for the correlation between the equations (see Maddala [1983, pp. 252–56]).

5. Cross-Sectional Analysis

In this section, we study the effect of international reporting strategies on bid–ask spreads, trading volume, and share price volatility across firms. Our cross-sectional sample is composed of 102 firms included in the *DAX 100* index during 1998. For these firms, we have studied the annual reports to identify the firms' reporting strategy. We also conducted a survey to confirm our classification, to find out when firms announced their switch, and to identify firms that have already declared to adopt *IAS* or U.S. *GAAP* in the future.

We consider the firms' disclosure policy for the fiscal year ending between 7/1/97 and 6/31/98 and code a binary variable (*IR97*). Panel A of table 1 shows that during that period there are 21 firms following an international reporting strategy: 11 firms prepare a “dual report,” 3 provide a reconciliation of income and shareholders' equity, and 7 provide a second set of consolidated financial statements.²⁴ Of these firms, 14 have chosen *IAS*, while only 7 firms have chosen U.S. *GAAP* as a reference standard for their international strategy.

To assess first whether firms with an international reporting strategy in fact provide more and higher-quality information, as claimed in section 2, we use annual report ratings published in *Capital* [1998]. They are based on a disclosure index derived at the Institute of Auditing at Saarland University. We obtain annual report ratings for 90 of our 102 sample firms. Comparing the ratings for firms following an international reporting strategy to those firms that provide German *GAAP* statements, we find that the mean and median ratings of the former group are significantly higher using a *t*-test and a Mann-Whitney-Wilcoxon test, respectively (see table 2). While firms following U.S. *GAAP* generally re-

²³ An alternative approach is to estimate the cost of capital model with 2SLS using the fitted probabilities from the probit disclosure model as the instrumental variable (see Barnow, Cain, and Goldberger [1980]). This follows directly from the unconditional expectation combining the two conditional expectations above (see Maddala [1983, p. 121]): $E(c_i) = \delta \Phi(\gamma'z_i) + \beta'x_i$. We use both approaches and find that they yield very similar results.

²⁴ All but four firms obtain an audit opinion for their international reporting, thereby reinforcing their commitment to international reporting. The four firms without an audit opinion are those that we have identified as effectively following a dual reporting strategy without explicitly calling it this. For details, see table 1. Excluding or reclassifying these four firms does not materially alter our cross-sectional results.

TABLE 2

Comparison of Annual Report Ratings of Firms Following an International Reporting Strategy and Firms Preparing German GAAP Statements

Annual report ratings are published in *Capital* (1998). The Institute of Auditing at Saarland University (Professor Küting) rates annual reports for fiscal year 1997 out of 300 points. This table reports the percentage of the points achieved for firms following an international reporting strategy (*IAS* or U.S. *GAAP*) and firms preparing German *GAAP* statements.

| | <i>N</i> | Mean | Median | Maximum | Minimum | Std. Dev. |
|-------------------------|----------|----------|----------|---------|---------|-----------|
| All Firms | 90 | 0.588 | 0.615 | 0.857 | 0.157 | 0.136 |
| German <i>GAAP</i> | 69 | 0.551 | 0.560 | 0.820 | 0.157 | 0.123 |
| International Reporting | 21 | 0.707*** | 0.743*** | 0.857 | 0.413 | 0.118 |
| <i>IAS</i> | 14 | 0.680 | 0.675 | 0.857 | 0.413 | 0.127 |
| U.S. <i>GAAP</i> | 7 | 0.760 | 0.780 | 0.853 | 0.597 | 0.082 |

*** indicates that the means (medians) of the two groups are significantly different at the 1% level using a *t*-test (Mann-Whitney-Wilcoxon test). The last two rows report the ratings for firms following *IAS* and firms following U.S. *GAAP* separately. Differences between the two groups are not significant at conventional levels.

ceive higher ratings than firms following *IAS*, the differences across these two groups are not significant. These results support the validity of our proxy. Table 2, however, also reveals that there is considerable variation in the ratings of the international reporting group and that firms may obtain a high rating without international reporting. We address this issue in the robustness checks.

Panel A in table 3 presents the descriptive statistics for the dependent variables. We use the average percentage bid–ask spread, median daily share turnover, and the standard deviation of daily returns as proxies for information asymmetry and liquidity.²⁵ We find that firms following international reporting strategies have significantly lower bid–ask spreads than the rest of the *DAX 100* firms. The average (median) spread of the former group is only 1.2% (0.5%), which is about a half (quarter) of the average (median) spread of the latter group. The differences in the means (medians) across the two groups are highly significant using a *t*-test (Mann-Whitney-Wilcoxon test). Panel A also suggests that the relative bid–ask spread is lower for firms following U.S. *GAAP* than for firms choosing *IAS*. The difference, however, is not statistically significant.

With respect to trading volume, we find that firms with international reporting strategies have a median turnover that on average is about 25% higher than the rest of the *DAX 100* firms. This difference in means (medians) across the two groups of firms is significant, with $p = 0.0571$ ($p = 0.0712$) using a *t*-test (Mann-Whitney-Wilcoxon test).²⁶ Again, the differences in the means (medians) across the international reporting strategies (*IAS* versus U.S. *GAAP*) are relatively small and insignificant.

²⁵ For more details on the computation of the variables, see table 3, panel A.

²⁶ We obtain similar results using the average daily turnover, as well as daily turnover scaled by daily market turnover. Daily turnover is calculated as the value of all shares traded in all market segments on the Frankfurt Stock Exchange divided by the market capitalization

TABLE 3
Descriptive Statistics for Regression Variables Including Differences in Means and Medians for International Reporting and German GAAP Firms

| Panel A: Dependent Variables ¹ | | | | | | |
|--|---------------------|-------------|------------|------------|-----------|-----------|
| Variable | Reporting | Number | Mean | Median | Std. Dev. | |
| Bid-Ask Spread | All | 102 | 0.02197 | 0.01959 | 0.01678 | |
| | If <i>IR97</i> = 0 | 81 | 0.02456 | 0.02245 | 0.01699 | |
| | If <i>IR97</i> = 1 | 21 | 0.01201*** | 0.00453*** | 0.01168 | |
| | If <i>IAS</i> | 14 | 0.01381 | 0.00566 | 0.01305 | |
| | If U.S. <i>GAAP</i> | 7 | 0.00841 | 0.00324 | 0.00792 | |
| Trading Volume | All | 102 | 0.00739 | 0.00725 | 0.00413 | |
| | If <i>IR97</i> = 0 | 81 | 0.00700 | 0.00674 | 0.00399 | |
| | If <i>IR97</i> = 1 | 21 | 0.00892* | 0.00891* | 0.00443 | |
| | If <i>IAS</i> | 14 | 0.00884 | 0.00825 | 0.00471 | |
| | If U.S. <i>GAAP</i> | 7 | 0.00909 | 0.00911 | 0.00414 | |
| Volatility | All | 102 | 0.02625 | 0.02601 | 0.00496 | |
| | If <i>IR97</i> = 0 | 81 | 0.02593 | 0.02564 | 0.00479 | |
| | If <i>IR97</i> = 1 | 21 | 0.02750 | 0.02681 | 0.00551 | |
| | If <i>IAS</i> | 14 | 0.02724 | 0.02604 | 0.00592 | |
| | If U.S. <i>GAAP</i> | 7 | 0.02800 | 0.02822 | 0.00498 | |
| Panel B: Firm Characteristics ² | | | | | | |
| Variable | Reporting | Mean | Median | Maximum | Minimum | Std. Dev. |
| Size: <i>MCAP</i> | If <i>IR97</i> = 0 | 4383928 | 1342140 | 55937920 | 114880 | 8585357 |
| | If <i>IR97</i> = 1 | 14295876*** | 6062560*** | 47485750 | 286420 | 14626505 |
| | All | 6424623 | 1825540 | 55937920 | 114880 | 10815175 |
| Free Float: <i>FFLOAT</i> | If <i>IR97</i> = 0 | 0.540 | 0.500 | 1.000 | 0.040 | 0.222 |
| | If <i>IR97</i> = 1 | 0.640* | 0.691 | 1.000 | 0.113 | 0.290 |
| | All | 0.560 | 0.517 | 1.000 | 0.040 | 0.239 |
| Capital Intensity: <i>LTA/TA</i> | If <i>IR97</i> = 0 | 0.305 | 0.299 | 0.883 | 0.001 | 0.216 |
| | If <i>IR97</i> = 1 | 0.402* | 0.414** | 0.796 | 0.012 | 0.197 |
| | All | 0.325 | 0.334 | 0.883 | 0.001 | 0.215 |
| Leverage: <i>LEV</i> | If <i>IR97</i> = 0 | 0.108 | 0.068 | 0.503 | 0.000 | 0.109 |
| | If <i>IR97</i> = 1 | 0.132 | 0.087*** | 0.480 | 0.000 | 0.139 |
| | All | 0.113 | 0.070 | 0.503 | 0.000 | 0.116 |

In contrast to our expectations, the average and median volatility of the international reporting group is slightly above (about 5%) the volatility of the German reporting group. The differences in the means (medians), however, are not statistically significant. But as explained in section

(which is the same as the number of shares traded divided by shares outstanding). If a firm has several share classes (e.g., preferred and common stock), we use only the trading volume and market capitalization of the main class, i.e., the one included in the *DAX 100* index. Note that we do not include trading volume on other—in particular foreign—exchanges. If this simplification has an impact, however, it should bias our results against finding the hypothesized effect. See also our robustness checks in section 4.2.

TABLE 3—continued

| Variable | Reporting | Mean | Median | Maximum | Minimum | Std. Dev. |
|---------------------------|--------------------|-----------|-----------|---------|---------|-----------|
| Profitability: <i>ROA</i> | If <i>IR97</i> = 0 | 4.11 | 3.06 | 22.29 | -5.23 | 4.70 |
| | If <i>IR97</i> = 1 | 6.65** | 6.00*** | 14.69 | 0.29 | 4.22 |
| | All | 4.64 | 3.91 | 22.29 | -5.23 | 4.70 |
| Foreign Listing: | | | | | | |
| <i>FLD</i> | If <i>IR97</i> = 0 | 0.185 | 0.000 | 1.000 | 0.000 | 0.391 |
| | If <i>IR97</i> = 1 | 0.857*** | 1.000*** | 1.000 | 0.000 | 0.359 |
| | All | 0.324 | 0.000 | 1.000 | 0.000 | 0.470 |
| Analyst Following: | | | | | | |
| <i>AFOL</i> | If <i>IR97</i> = 0 | 22.580 | 23.000 | 34.000 | 1.000 | 6.973 |
| | If <i>IR97</i> = 1 | 29.095*** | 30.000*** | 36.000 | 22.000 | 4.625 |
| | All | 23.922 | 25.000 | 36.000 | 1.000 | 7.054 |
| Authorized New | | | | | | |
| Equity: <i>EQ</i> | If <i>IR97</i> = 0 | 0.232 | 0.225 | 0.500 | 0.000 | 0.185 |
| | If <i>IR97</i> = 1 | 0.222 | 0.234 | 0.500 | 0.000 | 0.172 |
| | All | 0.229 | 0.230 | 0.500 | 0.000 | 0.181 |

¹The bid-ask spread is the average relative spread (i.e., absolute spread divided by the average of bid and ask) from June to December 1998. We obtained monthly averages per firm from the Xetra trading system on the Frankfurt Stock Exchange. The monthly average is calculated by the *FSE* as the mean relative spread measured in hourly intervals. Trading volume is the median daily turnover ratio, i.e., value of all shares traded on the Frankfurt Stock Exchange in all market segments divided by the market capitalization, between 1/1/98 and 12/31/98. Volatility is the standard deviation of daily (dividend-adjusted) returns between 1/1/98 and 12/31/98. We obtained all price and volume data from *Datastream*. *IR97* indicates the firm's reporting strategy for the fiscal year ending between 7/1/97 and 6/31/98. *IR97* is equal to zero if the firm does not follow an international reporting strategy. *IR97* = 1 indicates a "dual report," a reconciliation of income and shareholders' equity or a second set of consolidated financial statements in accordance with *IAS* or U.S. *GAAP*.

²*MCAP* is the market value (in 1000 Euro) of the firm's equity as of 1/1/98. *FFLOAT* is the percentage of shares that are not closely held. *LTA/TA* is the ratio of net property, plant, and equipment to total assets. *LEV* is the firm's leverage measured as total long-term liabilities divided by total assets. *ROA* is the average return on assets (in %), i.e., operating income divided by total assets, over the past five years. If the five-year average is not available, the last *ROA* is used instead. We obtained all financial data from the *Worldscope* database using the fiscal year ending between 7/1/97 and 6/31/98. *FLD* is a binary variable indicating that the firm is listed on the London or the New York Stock Exchange or has sponsored *ADRs* that have been privately placed or are trading on the U.S. *OTC* market. *AFOL* is the number of analysts providing earnings forecasts on *I/B/E/S* for the firm. *EQ* is (new) equity authorized at the shareholders' meeting for future equity offerings as a fraction of the total equity outstanding.

Asterisks indicates that the means (medians) of the two groups are significantly different using a two-tailed *t*-test (Mann-Whitney-Wilcoxon test): **p* < 0.1; ***p* < 0.05; ****p* < 0.01.

4, the effect of an international reporting strategy on volatility can be ambiguous—in particular for infrequently traded stocks.

These univariate results, however, should be interpreted cautiously because we do not control for differences in firm characteristics. Panel B in table 3 provides descriptive statistics for several firm characteristics. It is apparent that firms following an international reporting strategy are different from the rest of the *DAX 100* firms, thereby confirming the importance of an explicit control for self-selection bias in the cross-sectional regression. On average, the former are larger, more widely held, more capital-intensive, less leveraged, more profitable, and more frequently listed in the United Kingdom or the United States.

5.1 DISCLOSURE MODEL

In modeling the firm's reporting decision, we rely on cross-sectional determinants of corporate disclosures identified in the extant literature. In general, voluntary disclosures are positively related to firm size and

financing needs, and significantly associated with firm performance, where the direction of the relation may depend on the type of disclosure considered.²⁷ Leuz [1999*a*] confirms these determinants for German firms and, in addition, finds positive associations for the dispersion of ownership and the listing on foreign exchanges.

Thus, we use the log of the market value of equity, the capital intensity (defined as long-term assets divided by total assets), the five-year average return on assets (defined as operating income divided by total assets), and the percentage of widely held shares (i.e., free float) as proxies for firm size, financing needs, firm performance, and ownership dispersion, respectively. We also include a dummy variable indicating a listing in the United Kingdom or the United States. Note that German firms trading in London or on the U.S. *OTC* market do *not* have to prepare financial statements in accordance with *IAS* or U.S. *GAAP*.²⁸ These listings, however, are meant to capture disclosure pressures in international equity markets and the propensity to list on *NYSE* or *NASDAQ* in the future. We hypothesize a positive association for all variables.

Panel A of table 4 reports a probit regression of our international reporting dummy on these variables. The likelihood ratio statistic indicates that the disclosure model has significant explanatory power. All variables have the expected signs and are significant, except the coefficient of size and free float. Firm size and listing in the United Kingdom or the United States, however, are highly correlated ($\rho = 0.62$). Without the foreign listing dummy, the coefficient of firm size is positive and highly significant ($p = 0.0001$), while the coefficient of free float is positive but remains insignificant ($p = 0.315$). We are not concerned about this apparent collinearity in the data since we estimate the disclosure model only to control for self-selection bias. Moreover, the results reported below are qualitatively unchanged if the foreign listing dummy is excluded from the model.

Finally, as an additional robustness check, we use an alternative first-stage model suggested by Harris and Muller [1999] to control for a firm's decision to follow *IAS* and list in the United States.²⁹ We find that using this probit model to generate the inverse Mills ratios produces second-stage results that are very similar to those reported below, i.e., coefficients and significance levels are not materially different.

²⁷ See the survey of Lang and Lundholm [1993] as well as the results of their study.

²⁸ There are six firms in our sample that have to submit Form 20-F to the *SEC* because they are listed on the *NYSE* and hence have to follow U.S. *GAAP*. Note, however, that neither eliminating these firms from our sample nor controlling for *NYSE* listing effects via a dummy variable in the spread and turnover regressions materially alters the results reported below.

²⁹ Applying their specification to our setting, we estimate a probit regression including five-year average sales growth, U.K./U.S. listing, market capitalization, leverage, analyst following, new equity authorized by shareholders for future offerings as a fraction of total equity capital, and five-year *ROA*. All variables have the expected signs, except sales growth, where the sign is negative but insignificant.

TABLE 4
Two-Stage Cross-Sectional Regressions

Panel A: Disclosure Probit Model (First Stage)¹

$$IR97_i = \gamma_0 + \gamma_1 \log(firm\ value_i) + \gamma_2 ROA_i + \gamma_3 free\ float_i + \gamma_4 \frac{long-term\ assets_i}{total\ assets_i} + \gamma_5 UK/USlisting_i + \varepsilon_i$$

| Variable | Coefficient | Std. Error | z-Statistic | Prob. (Two-Sided) |
|----------------------------|-------------|---|-------------|----------------------|
| Constant | -5.651 | 2.344 | -2.411 | 0.016 |
| Firm Value | 0.208 | 0.153 | 1.361 | 0.173 |
| ROA | 0.067 | 0.038 | 1.778 | 0.075 |
| Free Float | -0.047 | 0.885 | -0.053 | 0.958 |
| Capital Intensity | 1.662 | 0.919 | 1.808 | 0.071 |
| U.K./U.S. Listing | 1.579 | 0.472 | 3.345 | 0.001 |
| LR Statistic (5 df) | 42.347 | McFadden R ² | | 0.408 |
| Probability (LR Statistic) | 0.0000 | Within Sample (vs. Naive) Classification Rate | | 89.22% (79.41%) |

Panel B: Bid-Ask Spread Model (Second Stage)²

$$\log(spread_i) = \gamma_0 + \gamma_1 IR97_i + \gamma_2 \log(firm\ value_i) + \gamma_3 \log(volume_i) + \gamma_4 \log(volatility_i) + \gamma_5 \log(free\ float_i) + \gamma_6 Inv.\ Mills\ ratio_i + \varepsilon_i$$

| Variable | Coefficient | Std. Error | z-Statistic | Prob. (Two-Sided) |
|---------------------|-------------|---------------------|-------------|----------------------|
| Constant | 2.806 | 0.939 | 2.988 | 0.003 |
| IR97 | -0.471 | 0.223 | -2.114 | 0.035 |
| Log(Size) | -0.449 | 0.036 | -12.441 | 0.000 |
| Log(Volume) | -0.360 | 0.087 | -4.164 | 0.000 |
| Log(Volatility) | 0.631 | 0.238 | 2.647 | 0.008 |
| Log(Free Float) | -0.223 | 0.097 | -2.300 | 0.022 |
| Inv. Mills Ratio | 0.306 | 0.145 | 2.106 | 0.035 |
| R ² | 0.816 | F-Statistic | 70.393 | |
| Adj. R ² | 0.805 | Prob. (F-Statistic) | 0.0000 | |

Panel C: Trading Volume Model (Second Stage)³

$$median\ turnover_i = \gamma_0 + \gamma_1 IR97_i + \gamma_2 \log(firm\ value_i) + \gamma_3 free\ float_i + \gamma_4 volatility_i + \gamma_5 Inv.\ Mills\ ratio_i + \varepsilon_i$$

| Variable | Coefficient | Std. Error | z-Statistic | Prob. (Two-Sided) |
|---------------------|-------------|---------------------|-------------|----------------------|
| Constant | -0.00196 | 0.00464 | -0.422 | 0.673 |
| IR97 | 0.00447 | 0.00178 | 2.516 | 0.012 |
| Log(Size) | 0.00003 | 0.00030 | 0.096 | 0.924 |
| Free Float | 0.00729 | 0.00163 | 4.466 | 0.000 |
| Volatility | 0.14985 | 0.06732 | 2.226 | 0.026 |
| Inv. Mills Ratio | -0.00348 | 0.00108 | -3.226 | 0.001 |
| R ² | 0.375 | F-Statistic | 11.536 | |
| Adj. R ² | 0.343 | Prob. (F-Statistic) | 0.0000 | |

TABLE 4—continued

Panel D: Volatility Model (Second Stage)⁴

$volatility_i = \gamma_0 + \gamma_1 IR97_i + \gamma_2 \log(firm\ value_i) + \gamma_3 free\ float_i + \gamma_4 beta_i + \gamma_5 Inv.\ Mills\ ratio_i + \varepsilon_i$

| Variable | Coefficient | Std. Error | z-Statistic | Prob. (Two-Sided) |
|---------------------|-------------|---------------------|-------------|----------------------|
| Constant | 0.03600 | 0.00485 | 7.419 | 0.673 |
| IR97 | 0.00381 | 0.00206 | 1.846 | 0.065 |
| Log(Size) | -0.00088 | 0.00036 | -2.458 | 0.014 |
| Free Float | -0.00410 | 0.00120 | -2.050 | 0.040 |
| Beta factor | 0.00611 | 0.00122 | 5.021 | 0.000 |
| Inv. Mills ratio | -0.00113 | 0.00139 | -0.812 | 0.417 |
| R ² | 0.223 | F-Statistic | 5.525 | |
| Adj. R ² | 0.183 | Prob. (F-Statistic) | 0.0002 | |

¹The sample in panel A is composed of 102 German firms included in the *DAX 100* index over the course of 1998. The coefficients are estimated with a binary probit regression using maximum-likelihood procedures. The dependent variable (*IR97*) is a dummy indicating whether the firm follows an international reporting strategy (= 1). Firm value is the natural log of the market value of the firm's equity as of 1/1/98. *ROA* is the firm's average return on assets (i.e., operating income divided by total assets), capital intensity is long-term assets (i.e., intangibles and net property, plant, and equipment) divided by total assets, and free float is the percentage of shares that are not closely held. U.K./U.S. listing is a binary variable indicating that the firm is listed on the London Stock Exchange or the New York Stock Exchange or has sponsored *ADRs* that have been privately placed or are trading on the U.S. *OTC* market. All financial data are obtained from the *Worldscope* database using the fiscal year ending between 7/1/97 and 6/31/98.

²The sample in panel B is composed of 102 German firms included in the *DAX 100* during 1998. The dependent variable is the firm's average percentage bid-ask spread from June to December 1998. We estimate the model using the two-stage procedure explained in section 3. Standard errors have been appropriately adjusted for the selection bias (see Maddala [1983]). *IR97* is a dummy indicating whether the firm follows an international reporting strategy in 1997. Log(\cdot) stands for the natural logarithm. Size is the market value of firm's equity as of 1/1/98, volume is measured as the average daily turnover on the Frankfurt Stock Exchange in 1998, volatility is measured as the standard deviation of daily returns in 1998, free float is the percentage of shares that are not closely held as of the beginning of the fiscal year, and the inverse Mills ratio is computed from the probit model in panel A.

³The sample in panel C is composed of 102 German firms included in the *DAX 100* during 1998. The dependent variable is the firm's median daily turnover ratio in 1998. We estimate the model using the two-stage procedure explained in section 3. Standard errors have been appropriately adjusted for the selection bias (see Maddala [1983]). *IR97* is a dummy indicating whether the firm follows an international reporting strategy in 1997. Log(size) is the natural log of the market value of the firm's equity as of 1/1/98, free float is the percentage of shares that are not closely held, volatility is the standard deviation of daily returns in 1998, and the inverse Mills ratios are computed from the probit model in panel A.

⁴The sample in panel D is composed of 102 German firms included in the *DAX 100* during 1998. The dependent variable is the standard deviation of daily returns in 1998. We estimate the model using the two-stage procedure explained in section 3. Standard errors have been appropriately adjusted for the selection bias (see Maddala [1983]). *IR97* is a dummy indicating whether the firm follows an international reporting strategy in 1997. Log(size) is the natural log of the market value of the firm's equity as of 1/1/98, free float is the percentage of shares that are not closely held, beta factor is the estimate provided by *Worldscope* as of the fiscal year-end, and the inverse Mills ratios are computed from the probit model in panel A.

5.2 BID-ASK SPREADS

Previous theoretical and empirical studies suggest numerous determinants of the bid-ask spread other than the firm's disclosure policy. The findings are that relative spreads are negatively associated with trading volume, share price, and market-maker competition and positively associated with share price volatility and the presence of insiders (e.g., Stoll [1978a], Chiang and Venkatesh [1988], and Glosten and Harris [1988]).

In modeling the bid-ask spread regression, we follow the extant literature.³⁰ We use the market value of the firm's equity and the average daily

³⁰ We do not include a variable for competition among market makers because the spreads are taken from an order-driven environment. That is, they arise from the best bid

share turnover (i.e., the value of shares traded scaled by the firm's market value of equity), however, as opposed to price and the value of shares traded. While the two specifications differ only in the scaling of the two variables, the former facilitates the estimation of our two-stage model (as well as the simultaneous-equation model in the robustness checks) because it uses the same size variable in the disclosure and the bid-ask spread regressions. Besides, the minimum tick size is less of an issue in the German market since share prices are quoted with two decimal places. Moreover, firm size controls at least partially for the firm's information environment. Therefore, the chosen specification seems conceptually more appropriate for our study.³¹ Finally, we use the firm's free float as an inverse proxy for the presence of insiders because shareholders with large and closely held stakes generally have superior access to information about the firm. As most models identify multiplicative relationships among the determinants (e.g., Stoll [1978b] and Glosten and Milgrom [1985]), we follow the literature in using a log-linear specification.

Panel B of table 4 presents the results from a two-stage estimation using inverse Mills ratios from the probit model in panel A to account for the self-selection problem with the firm's disclosure strategy. Our model is highly significant and explains more than 80% of the variation in relative bid-ask spreads, which is similar to the R^2 obtained in other cross-sectional studies. The coefficient of the international reporting dummy is negative as predicted and statistically significant. Moreover, the marginal effect of the dummy is economically significant. Taking the antilogarithm of the coefficient, our model suggests that an international reporting strategy is associated with an average reduction in the bid-ask spread of more than 35%. All other variables have the expected signs and are highly significant. Furthermore, the significance of the inverse Mills ratio confirms that it is important to adjust for selection bias.

5.3 TRADING VOLUME (SHARE TURNOVER)

Prior studies on the determinants of trading volume have identified significant associations with volatility (+), firm size (+/-), *S&P 500* inclusion (+/-), and institutional ownership (+) (e.g., Bessembinder, Chan, and Seguin [1996] and Tkac [1999]). We follow the literature and use share turnover (as opposed to unscaled trading volume) to facilitate the cross-sectional comparison. Since all our firms are included in the *DAX*

and best ask among all limit orders in the electronic trading system (Xetra). Using data from an order-driven market is conceptually appealing because other spread components unrelated to information asymmetry, such as inventory holding costs or monopoly rents of the specialist, are presumably less important if all traders can post limit orders. Comparisons of order- and quote-driven markets support this conjecture (see, e.g., Huang and Stoll [1996]).

³¹ We checked that the alternative specification yields qualitatively similar results and in particular that the international reporting dummy is statistically significant as well.

100 index, we do not control for index inclusion.³² Institutional ownership does not as yet play the same role in Germany as in the United States. Instead, we control for concentration of ownership based on the free float because large shareholders control many German corporations. Besides, a positive association with share turnover follows almost immediately from the definition of the free float.

Panel C of table 4 reports the results from a two-stage estimation using inverse Mills ratios from the probit model in panel A to account for the self-selection of the firm's disclosure strategy. Our model is highly significant and explains more than 35% of the variation in share turnover, which compares to about 23% in Tkac [1999]. The dummy variable indicating the firm's reporting strategy is highly significant. Our results suggest that the marginal effect of the dummy is also economically significant. On average, international reporting firms have a median daily turnover that is 0.0044 above the German *GAAP* firms—*ceteris paribus*. Compared to the sample average (0.0074), this represents an increase of more than 50%.

All the other coefficients have the expected signs and are highly significant, except the coefficient on firm size.³³ Tkac [1999] finds a significantly negative coefficient for size in her turnover regression and suggests that large firms typically have a larger analyst following and greater media coverage and hence *ceteris paribus* *less* trading based on private information. This, however, should have a *positive* effect on uninformed trading. Since our turnover proxy does not distinguish between the two effects, we may observe an insignificant coefficient. Using unscaled trading volume (as opposed to turnover) we obtain a significantly positive size coefficient as one would expect—all other coefficients including the reporting dummy are qualitatively unchanged. Our results are also not materially affected if a log-linear specification—as for the spread—is used.

5.4 SHARE PRICE VOLATILITY

For the volatility model, we use firm size (–), free float (–), and the beta factor (+) as control variables. That is, we estimate a similar two-stage model as that for the trading volume, except that the standard deviation of daily returns is now the dependent variable and the beta factor is used as an additional control variable. The results are in panel D of

³² We also check whether *DAX* inclusion has any effect on our results. The *DAX* is composed of the 30 largest and most frequently traded German stocks. We find that a dummy variable indicating *DAX* inclusion is significant in the bid–ask spread and the trading volume regression. But using a *DAX* dummy (and interacting it with the reporting dummy) does not materially change the magnitude or significance level of the international reporting coefficient and hence does not alter any of our conclusions.

³³ Using the average daily turnover in the regression produces similar results for all other variables but a negative coefficient for firm size, with a *z*-statistic = –1.28.

table 4. In contrast to our hypothesis, the international reporting dummy has a positive coefficient that is significant at the 10% level. Further tests, however, reveal that the smaller and less liquid stocks of the *DAX 100* index drive this result.³⁴ These results are in line with the findings by Auer [1998] and the expectation that for less frequently traded stocks, the reporting change may actually increase volatility. All the other variables have the expected signs and are significant.

5.5 *IAS* VERSUS U.S. *GAAP*

An issue of much interest to standard setters is whether the marginal effects are different for *IAS* and U.S. *GAAP* adopters. Thus, we re-estimate all second-stage regressions dropping the *IAS* and U.S. *GAAP* firms, respectively. In both cases, the international reporting coefficient remains significant and is similar in size to the respective coefficient reported in table 4. Similarly, interacting the reporting variable and a dummy indicating the standard produces insignificant results. Thus, we are unable to find significant differences across the two accounting standards, suggesting that it is the commitment to increased disclosure and not the standard per se that matters.

While this finding is based on a small sample and hence should be viewed with caution, it is consistent with the results in Leuz [1999*b*]. The latter examines German firms that face a similar regulatory environment but have to choose between *IAS* and U.S. *GAAP* by virtue of their listing on the “New Market.” The results suggest that the choice between *IAS* and U.S. *GAAP* does not have measurable consequences on the bid–ask spread and turnover for these firms.

5.6 ALTERNATIVE EXPLANATIONS AND ROBUSTNESS CHECKS

There are essentially two ways to look at our international reporting variable. It may be interpreted more broadly as a proxy for the firm’s overall commitment to disclosure. For the broad interpretation, it is of no concern that the firm may complement international reporting with other disclosure instruments. Our results simply document the benefits of increased disclosure. Alternatively, the dummy variable can be interpreted more narrowly as measuring the marginal effect of international reporting per se. In this case, however, it is a concern that firms with international reporting strategies are likely to have more forthcoming investor relations. To the extent that investor relations and financial reporting are complements *and* firm size does not control for these other

³⁴ The *DAX 100* is composed of 30 *DAX* and 70 *MDAX* firms. Introducing a *DAX* dummy as well as interacting this variable with the reporting dummy shows that the significantly positive coefficient is driven only by international reporting firms in the less liquid *MDAX*. For the *DAX* firms, the effect of increased disclosure on volatility is about zero, as in Bushee and Noe [2000]. See also n. 29.

disclosure instruments,³⁵ the coefficients in the cross-sectional regressions may overstate the marginal effect of international reporting per se.

Although we favor the broad interpretation, we attempt to control explicitly for the firm's communication with analysts—in particular in the light of the results in Botosan [1997]. Following her approach, we obtain *I/B/E/S* data on the number of analysts following the firm in 1998 and construct a binary variable that is equal to one if the number of analysts is below the median of 25. We then re-estimate the spread and the turnover regressions, including the binary variable and its interaction, with the reporting dummy (not reported). We find that the results reported in table 4 are robust to this extension of the model. In particular, the international reporting coefficient remains highly significant. Moreover, the interaction term is insignificant in both regressions. This suggests that the marginal effect of international reporting is similar for firms with low- and high-analyst following and not diluted for the latter group as in Botosan [1997].

To further mitigate the concern that some other unobserved variable drives our results, we also study changes in our information asymmetry proxies around the switch to international reporting. Before we turn to this longitudinal analysis in section 6, we perform additional cross-sectional robustness checks.

A concern raised in previous studies using *relative* bid–ask spreads is that differences in the denominator, i.e., share price, may drive the results. This problem may exist when there is a nontrivial minimum tick size, but it is less likely to occur when share prices are quoted with two decimal places.³⁶ To address this issue, we re-estimate the cross-sectional spread regressions using the average of the period over which the spreads are computed as an additional control variable. We find that our results are not materially altered and in particular that the international reporting dummy remains significant.

One way to subject our “commitment story” to further scrutiny is to replace the international reporting dummies with the *annual report* ratings in table 2. The latter also reflect voluntary disclosures that are *not* a consequence of an international reporting strategy. That is, it is possible for a firm to have a high rating for its annual report without explicitly committing to *IAS* or U.S. *GAAP* financial statements. Since the latter is more difficult to reverse, the “commitment story” suggests that the results for the international reporting dummy are stronger than the results for the annual report ratings.

³⁵ Firm size has been shown to be associated with many different corporate disclosures to the capital market as well as to financial analysts. See Lang and Lundholm [1993] for a survey.

³⁶ In equilibrium and in the absence of a minimum tick size, we expect the absolute spread to move with changes in share price such that the percentage spread is unchanged.

To examine this hypothesis, we estimate the same models as in table 4, substituting the annual report ratings for the international reporting dummy. Since the dependent variable in the disclosure model is now a continuous variable, we use full maximum-likelihood estimation. We find that the coefficient of the annual report rating has the right sign but is not significant at the 10% level in the spread or the trading volume regression (not reported).³⁷ Moreover, the coefficients, i.e., marginal effects, are substantially smaller than the marginal effects of international reporting. That is, a firm would have to increase its rating by more than 50% (more than 0.50 percentage points) to get a comparable reduction in the bid–ask spread (increase in turnover), which seems unrealistic for the average German *GAAP* firm given the descriptive statistics in table 2. Thus, assuming that the ratings are reasonable proxies for voluntary disclosures, these results are consistent with the notion that it is the *commitment* to increased disclosure (and not merely voluntary disclosures) that leads to a reduction in the information asymmetry component of the firm’s cost of capital.

A different concern is that we have analyzed the association between the firm’s reporting strategy and bid–ask spreads or trading volume separately. The fact that international reporting has a joint effect on both variables implies that turnover cannot be treated as exogenous in the bid–ask spread model. We conjecture that the positive effect of international reporting on turnover should bias the reporting coefficient downward in the bid–ask spread model and hence work against our hypotheses.

There are two ways to explore this issue further. First, we estimate a three-equation system, including both the spread and the trading volume model along with the disclosure model, where the latter is specified as a linear probability model to reduce computational complexity and allow full maximum-likelihood estimation. But because this system is only identified via the functional form, an alternative approach is to eliminate the turnover variable in the spread regression and estimate a reduced form. We use both approaches and find—as hypothesized—a *higher* reporting coefficient in the spread regression compared to those reported in table 4. Thus, our conclusions do not change if we account for a joint effect on spreads and turnover.

6. “Event Study”

In this section, we study changes in our proxies around the change in the firm’s reporting strategy, i.e., the switch to international reporting. Looking at the same firm over time should hold many firm characteristics constant. We then pool firms in event time to estimate the average

³⁷ Since we have annual report ratings for only 90 of our 102 sample firms, we check that the different results are not driven by differences in the sample composition.

TABLE 5
Analysis of Bid-Ask Spreads Before and After the Switch to International Reporting

The sample consists of 15 firms that switched to an international reporting strategy for the first time for fiscal years ending between 12/31/97 and 12/31/98. All calculations are based on monthly averages of the relative spreads (see table 3, panel A).

| | Spread Ratio ¹ (<i>n</i> = 15) | Index-Adjusted Spread Ratio (<i>n</i> = 15) | Spread Ratio <i>FYE</i> 1997 Only (<i>n</i> = 5) | Spread Ratio <i>FYE</i> 1998 Only (<i>n</i> = 10) | "Announcement- Adjusted" Spread Ratio (<i>n</i> = 11) |
|------------------|--|--|---|--|---|
| Mean | 0.835*** | 0.886** | 0.920 | 0.793*** | 0.766*** |
| Median | 0.878*** | 0.884** | 0.940 | 0.814*** | 0.706*** |
| No. of Firms < 1 | 14 | 13 | 4 | 10 | 10 |

¹The spread ratio is the relative bid-ask spread *after* the publication of the international annual report divided by the relative bid-ask spread *before* its publication. Annual reports are published in April or May after the respective fiscal year-end (*FYE*). Spread data are not available before January 1998 for the *DAX* and March 1998 for the *MDAX* firms. Therefore, we use the spreads in January and February (March) 1998 for the *DAX* (*MDAX*) firms and compare them to the spreads in the same months one year later to estimate the change in relative spread for firms that switched to international reporting in 1997. For firms that switched to international reporting in 1998, the spread ratios are based on the average spreads in May and June for the *DAX* firms and June only for the *MDAX* firms (because spread data are missing in May 1998 for these firms).

The first column reports the spread ratios for all 15 switching firms. The second column reports index-adjusted spread ratios. That is, the spreads of all switching firms are scaled by the contemporaneous average spread of all firms that are in the same index (*DAX* or *MDAX*) and have neither switched nor announced a change in their reporting strategy as of June 1999. The third and fourth columns report the spread ratios separately for firms that switched in 1997, 1998. Because many firms announced their switch to international reporting around the publication of their previous annual report, we calculate "announcement-adjusted" spread ratios. This is possible for all 1998 firms and one firm in 1997. For these spread ratios, presented in the last column, we use the average spreads in January and February (March) 1998 for the *DAX* (*MDAX*) firms and compare them to the average spreads in May and June (June only) one year later.

Asterisks indicate that the means (medians) of the two groups are significantly different using a two-tailed *t*-test (Wilcoxon signed rank test): **p* < 0.1; ***p* < 0.05; ****p* < 0.01. The last row indicates how many firms in the respective group have a ratio smaller than one, i.e., experience a decrease in the relative bid-ask spreads around the switch to international reporting.

and median effect of the switch. This analysis provides an additional robustness check of the cross-sectionally estimated marginal effects because in principle other events that are uncorrelated with the firm's reporting strategy should "wash out." Since our sample is relatively small, however, we control explicitly for contemporaneous changes in all *DAX* 100 firms and use a control sample of firms.

6.1 BID-ASK SPREAD

Unfortunately, bid-ask spreads are not available for German firms prior to 1998. This precludes an event study for firms that have switched prior to December 1997. For five firms that have adopted an international reporting strategy as of the fiscal year ending 12/31/97, we use the average relative bid-ask spread in the first months of 1998, before the annual report is actually published, and compare it to the average spread in the same months one year later.³⁸ For ten firms that have switched as of the fiscal year ending 12/31/98, we use the average spread in the months after the publication of its last German *GAAP* report in 1997 and compare it to the average spread in the same months after the publication of the first international report in 1998. In theory, a commitment

³⁸ We use the same months to control for seasonal patterns.

to increased disclosure has a permanent effect on bid–ask spread and hence we hypothesize that bid–ask spreads are lower even one year after the switch to international reporting.

Table 5 provides the details of our analysis. To facilitate a comparison across firms we compute a spread ratio, which is the average percentage spread after the publication of the first international report divided by the average percentage spread before its publication. We find that the mean and the median spread ratio are below one, indicating a decrease in the bid–ask spread around the switch to international reporting. These ratios are significantly different from one at the 1% level using a *t*-test and Wilcoxon signed rank test, respectively. These results are consistent with our hypotheses. To check for index-wide changes in the spreads, we also compute index-adjusted spread ratios using all firms in the same index (*DAX* or *MDAX*) that have neither switched to international reporting nor announced (up to June 1999) that they will do so in the future. We find that the index-adjusted ratios are relatively close to the unadjusted ratios. The mean and the median index-adjusted ratios are significantly different from one and there are still 13 out of 15 firms that experience a decrease in the bid–ask spread after the switch to international reporting. Thus, our earlier results do not seem to be an artifact of market-wide changes across time.

The mean and the median of the index-adjusted ratios indicate that the (relative) bid–ask spreads are approximately 11% lower after the adoption of international reporting. While this decrease is considerably smaller than the estimated marginal effect of international reporting (about 35%) in the cross-sectional analysis, the following caveat should be kept in mind. Firms typically announce the adoption of international reporting standards prior to the publication of the annual report. To the extent that the announcement represents a credible commitment, the reduction in bid–ask spread may occur prior to the actual publication of the annual report. Due to the data limitations, we are not able to fully control for announcement effects in the event study. In particular, for firms switching in 1997, the results in table 5 are likely to underestimate the international reporting effect.³⁹ This may explain why the spread ratios in 1997 are considerably smaller than the ratios in 1998 (see table 5). But even for firms switching in 1998, we are not likely to pick up the entire effect since several firms announced their reporting change before or during the time period that we use to compute the *pre-event* spreads.

To assess the impact of announcement effects on our results, we compute spread ratios (if possible) as the average bid–ask spread in the months after the publication of the first international financial report divided by the average bid–ask spreads in the months before the announcement date. We are able to compute 11 “announcement-adjusted”

³⁹ Four out of five firms that switch in 1997 have announced their reporting change during or before the time period for which we calculate the “before publication” spreads.

spread ratios (see table 5, last column). As hypothesized, these ratios indicate a much larger reduction in the bid–ask spread after the switch to international reporting. The mean (median) reduction is approximately 23% (29%), which is much closer to the marginal effects estimated in the cross-sectional regressions.

Finally, we address the concern that the reported reduction in percentage spreads for the international reporting firms is driven by share price appreciation over the event period. We compute the stock return for each international reporting firm over the event window and find that the average and the median return are negative (−0.187 and −0.233, respectively), which is similar to the market’s return over this period. Thus, our results do not seem to be driven by share price appreciation over the event period.

6.2 TRADING VOLUME AND VOLATILITY

For the other two information asymmetry proxies, trading volume and volatility, we can perform a more elaborate event study. To calculate the pre-event proxies, we require at least a one-year trading history prior to the switch from German *GAAP* to international reporting. Moreover, we consider only firms that have switched up to the fiscal year ending on or before 12/31/97 to ensure sufficient data to calculate the post-event proxies. Finally, for each sample firm, we have to be able to identify a German *GAAP* control firm following the matching procedure described below. There are 15 firms that satisfy the data requirements.

Our design corresponds to the following time line: event date t is the fiscal year-end, at which time the firm switches to an international reporting strategy. All our sample firms release their annual reports within five months after the fiscal year-end. Therefore, we calculate the proxies in the *post-event* period over one year, starting on the first trading day of the sixth month after the firm’s fiscal year-end. In defining the *pre-event* period, potential announcement effects have to be taken into account. That is, investors may adjust their trading behavior as soon as the firm has announced a switch to an international reporting strategy, which may result in confounding effects if the event window chosen is too small. For this reason, our survey asked firms to indicate when they had announced the adoption of international reporting standards for the first time. The answers received reveal that firms typically made an announcement late in the fiscal year or even after its end. Therefore, for those firms (3) that did not indicate a date, we assume that the announcement was made in the last quarter of the fiscal year of the switch. Therefore, we calculate the proxies in the pre-event period over one year ending *either* on the last trading day of the third quarter in the “switch year” *or* on the last trading day of the month prior to the actual announcement, whichever is earlier.

For each firm, we compute a ratio dividing the average value of the respective proxy in the post-event period by its average value in the pre-event period. Ratios greater than one indicate that the proxy (e.g., daily

turnover) attains higher levels after the switch to an international reporting strategy than before. To control for market-wide effects, we also calculate market-adjusted ratios, where we standardize the proxies in each period by the average value of the proxy for the *DAX 100* index.⁴⁰ Average and median market turnover fluctuates from year to year but does not exhibit an obvious trend. Daily volatility, however, seems to be higher in recent years.

We also construct a control sample matching the international reporting firms with firms that report according to German *GAAP*. We match based on industry and firm size. That is, we pick the firm in the industry that is closest in terms of market capitalization. Note that our control firms tend to be smaller because frequently the largest firm(s) in the industry is(are) the one(s) that adopt(s) an international reporting strategy. We compute all proxies for the control firms as well using the event date of the respective sample firm.

Panel A of table 6 presents the turnover ratios for our sample as well as the control firms. We find that for 11 out of 15 firms, share turnover increases around the switch to international reporting. Both the average and the median ratio are clearly greater than one for the international reporting sample, irrespective of the form of standardization. Henceforth, we use the median ratio for our comparisons because the average ratio is somewhat skewed by a firm that more than doubled its turnover around the event. We find that the median increase in turnover around the event date is 13.8%, compared to 5% for the control firms and 5.4% for the *DAX 100* index. Based on a Wilcoxon signed rank test, the median ratio is statistically different from one for the sample firms, whereas the increase is statistically insignificant for both controls. However, we are unable to reject the hypothesis of equal median ratios across sample and control firms.

Using market-adjusted ratios, the median increase in turnover around the switch to international reporting is 13.4% for the sample firms and 5.9% for the control firms. Both ratios, however, are not statistically different from one and also are not statistically different from each other. Using the control-firm-adjusted ratios, the median increase in turnover around the switch to international reporting is 18.2% and almost statistically different from one ($p = 0.118$) using a two-sided Wilcoxon signed rank test.⁴¹

Thus, the changes in turnover around the switch to international reporting are consistent with our hypotheses, as well as the cross-sectional analysis. At least based on the median, however, the percentage change

⁴⁰ Using all *DAX 100* firms (including those that have switched to international reporting) is conservative because it is likely to bias our results against finding the hypothesized effects.

⁴¹ Note that the use of two-sided tests is conservative because we have directional hypotheses. Using one-sided tests, all sample firm ratios (irrespective of the form of standardization) would be statistically different from one at the 10% level, but we would still not be able to reject the null hypothesis of equal medians for sample and control firm ratios.

TABLE 6
Analysis of Turnover and Volatility Before and After the Switch to International Reporting for International Reporting and Control Firms

The sample consists of 15 firms that have switched to an international reporting strategy between 1993 and 1997. The control firms are matched based on industry and size.

| Panel A: Turnover Ratios ¹ | | | | | | | DAX 100 Index | |
|---|-------------------|----------------------|-----------------------------------|--------------------------------------|-------------------|----------------------|---------------|-------|
| Sample Firms | Turnover Ratio | TR (Market-Adjusted) | TR (Scaled by Control Firm Ratio) | Market-Adjusted TR (with Audited IR) | Turnover Ratio | TR (Market-Adjusted) | TR | TR |
| Mean (n = 15) | 1.524 | 1.465 | 1.291 | 1.628 | 1.102 | 1.073 | | 1.035 |
| Median (n = 15) | 1.138 (p = 0.065) | 1.134 (p = 0.182) | 1.182 (p = 0.118) | 1.293 (p = 0.046) | 1.050 (p = 0.410) | 1.059 (p = 0.755) | | 1.054 |
| No. of Firms > 1 | 11 | 8 | 9 | 8 (out of 12) | 8 | 8 | | — |
| Panel B: Volatility Ratios ² | | | | | | | DAX 100 Index | |
| Sample Firms | Volatility Ratio | VR (Market-Adjusted) | VR (Scaled by Control Firm Ratio) | Market-Adjusted VR (with Audited IR) | Volatility Ratio | VR (Market-Adjusted) | VR | VR |
| Mean (n = 15) | 1.328 | 0.953 | 1.011 | 0.948 | 1.311 | 0.963 | | 1.426 |
| Median (n = 15) | 1.244 | 0.975 | 1.009 | 0.945 | 1.278 | 0.966 | | 1.414 |
| No. of Firms < 1 | 3 | 9 | 6 | 8 (out of 12) | 4 | 9 | | — |

¹The first column reports the ratio of average daily turnover (TR) in the post-event period divided by average daily turnover in the pre-event period. The second column presents market-adjusted figures where for each period the average turnover is scaled by the average market turnover in that period. In the third column average turnover is scaled analogously by the turnover of the control firm in the respective period. The fourth column provides market-adjusted turnover ratios for firms with audited international reporting only, i.e., three firms classified as “effectively dual reporting” are excluded. The fifth and sixth columns report corresponding numbers for the control sample and the last column reports the average and median turnover ratio for all DAX 100 firms across all event dates. The second row also informs with two-sided p-values in parentheses whether the median turnover ratio is statistically different from one using a Wilcoxon signed rank test. The last row indicates how many firms in the respective group have a ratio greater than one, i.e., experience an increase in turnover.

²The first column reports the ratio of the standard deviation of daily returns (VR) in the post-event period divided by the standard deviation of daily returns in the pre-event period. The second column presents market-adjusted figures where for each period the standard deviation is scaled by the standard deviation of daily DAX 100 index returns in that period. In the third column, standard deviation is scaled analogously by the standard deviation of daily returns of the respective control firm in the respective period. The fourth column provides market-adjusted volatility ratios for firms with audited international reporting only, i.e., three firms classified as “effectively dual reporting” are excluded. The fifth and sixth columns report corresponding numbers for the control sample and the last column reports the average and median volatility ratio for the DAX 100 index across all event dates. The last row in the table indicates how many firms in the sample have a ratio smaller than one, i.e., experience a decrease in volatility around the switch.

in turnover is considerably smaller than the marginal effect of international reporting (about 50%) estimated in the cross-sectional study. Moreover, the significance levels of the event study are relatively low. One obvious explanation for the latter is sample size. The lower magnitudes and significance levels in the event study may also result from differences in the composition of reporting strategies because we had to drop six international reporting firms used in the cross-sectional analysis.

There is another explanation. Two of the four firms that experience a decrease in turnover around the event are firms that we classified as “effectively” dual reporting only. These firms make references to international reporting practice, provide substantial additional disclosures, and apply some *IAS* or U.S. *GAAP* standards. They did not, however, seek an audit opinion stating that their annual report is in compliance with both *IAS* and German *GAAP*, as the other dual reporting firms did (see table 1). One might question the commitment effect of such a reporting strategy. Excluding these firms results in a market-adjusted median turnover ratio for the international reporting group of 1.293, which is statistically different from one at the 5% level using a Wilcoxon signed rank test.⁴² That is, the median increase in market-adjusted turnover around the switch to international reporting is 29.3%, which is considerably closer to the marginal effect in the cross-sectional analysis than the median increase reported in panel A of table 6. Thus, the event-study results are sensitive to the inclusion of firms classified as “effectively” dual reporting.⁴³

Another concern is that we pick up only part of the increase in turnover because we calculate the ratios based on trading volume on the Frankfurt Stock Exchange. Although Frankfurt is the main exchange for all our sample firms and we use trading volume from all market segments, many of the sample firms are listed abroad. Because international reporting is presumably most useful to foreign investors, we expect that the (percentage) changes in turnover are larger on foreign exchanges. Thus, our approach of calculating turnover exclusively on the main exchange is conservative and likely to bias our results against finding an increase in turnover.

In particular, we are concerned with firms that are listed on the London Stock Exchange (*LSE*) or trade as *ADRs* in the U.S. *OTC* market because investors in these markets are used to international reporting standards (e.g., *IAS* or U.S. *GAAP*). With the exception of Daimler Benz,

⁴² Again, we use the median ratio because one firm more than doubled its turnover around the event. Note that when this outlier is excluded, the median turnover ratio is still 1.276.

⁴³ Note that this is *not* the case in the cross-sectional analysis. A potential explanation for this difference is that the event study and the cross-sectional analysis measure the effect at different points in time. By 1998, all firms classified as “effectively dual reporting” have announced that they will provide full international reports in the near future (see panel A in table 1), which may finally make the reporting strategy credible.

our sample firms do not list on the *NYSE* during the post-event period. Although a *NYSE* listing generally follows a switch to U.S. *GAAP*, the latter generally precedes the former by more than one year and hence is *outside* our post-event window. This alleviates concern that during the post-event period trading volume is shifted from the Frankfurt Stock Exchange to the *NYSE*, as well as the concern that we are picking up *listing* as opposed to *disclosure* effects.

To address this issue anyway, we examine *LSE* and *OTC* trading volume in the pre- and post-event periods. Our results (not reported) indicate a substantial increase in turnover around the adoption of international reporting. In percentage terms, the increase in turnover is larger abroad than on the Frankfurt Stock Exchange. These findings are consistent with our hypotheses. The trading volume in London (in the *OTC* market), however, is on average less than a tenth (a hundredth) of the trading volume at Frankfurt. Thus, turnover at the *LSE* and in the *OTC* market is too small to have a significant impact on the results reported in panel A of table 6.

In summary, the analysis of turnover suggests that firms experience a substantial increase in trading volume around the adoption of international reporting standards. This confirms the cross-sectional results and makes it unlikely that they are driven by some other unobserved variable. But the event study also suggests that in the turnover regression the magnitude of the reporting coefficient has to be interpreted cautiously.

Finally, we compute analogous volatility ratios for the switching and the control firms. The results are presented in panel B of table 6. Only 3 firms experience a decrease in volatility around the switch to international reporting. These ratios, however, are not market adjusted. Such an adjustment is important due to swings in volatility over time. Using market-adjusted ratios, 9 out of 15 firms experience a decrease in volatility around the event date. The average and the median market-adjusted volatility ratios are smaller than one, but neither of them is statistically different from one. Moreover, the control firms exhibit almost the same decrease in volatility around the event dates. Consequently, the mean and median control-firm adjusted volatility ratios are close to one and the ratios of sample and control firms are not statistically different from each other. This suggests that the switch to international reporting is not responsible for the decrease in volatility. But again, these results are not surprising given the findings of previous studies and given the limitations of volatility as a proxy for the information asymmetry component of the firm's cost of capital.

7. Conclusions

Economic theory provides compelling arguments that a commitment by a firm to increased levels of disclosure should lower the information asymmetry component of the firm's cost of capital. Documenting this relationship, however, has been difficult empirically.

In this paper, we study a sample of German firms that have adopted *IAS* or U.S. *GAAP* accounting standards in their consolidated financial statements. This international reporting strategy commits firms to substantially increased levels of disclosure but has no immediate tax or dividend implications. Moreover, the disclosure levels in Germany under German *GAAP* have been characterized as being low. For these reasons, the experimental setting of our study seems particularly suited to document the economic consequences of increased disclosure.

Our evidence is consistent with the notion that firms committing to increased levels of disclosure garner economically and statistically significant benefits. We show in a cross-sectional analysis that an international reporting strategy is associated with lower bid–ask spreads and higher share turnover when we control for various firm characteristics (e.g., performance, firm size, and foreign listings) as well as selection bias. Additional sensitivity analysis supports the robustness of our findings. A subsequent “event study” around the switch to international reporting produces corroborating results.

For share price volatility, we are unable to document a negative association or a reduction around the switch as hypothesized. We also find only minor differences between firms following U.S. *GAAP* and those following *IAS*. While this comparison is based on a relatively small sample, and hence has to be viewed as suggestive only, it is consistent with the notion that the commitment to increased disclosure, and not the standards per se, is what matters. More research is necessary to substantiate this finding.

One obvious extension of our study would be to include firms from other countries that have adopted *IAS* or U.S. *GAAP* for their financial statements. While such a cross-country study would clearly be interesting and increase the sample substantially, it may exacerbate control problems because many institutional arrangements (such as capital market regulation) held constant by our design would then have to be accounted for explicitly. We leave this issue to future research.

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